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COMMENTARY ON CORDINGLEY ET AL. (2009)

Is isolation the major genetic concern for endangered equids?

Although hybridization between closely related species is a natural phenomenon that can operate as an important evolutionary force, it has nevertheless contributed to the extinction of numerous species. Where the causes of hybridization are largely anthropogenic, therefore, its consequences need to be carefully assessed. Such investigations become pressing when one or both of the species concerned are endangered, since some form of management intervention may be required to limit the hybridization. Nevertheless, observations of hybridization involving species of conservation concern do not in themselves necessitate management action.

Cordingley *et al.* (2009) report the first case of natural hybridization between two equid species; the abundant plains zebra (*Equus burchelli*) and the endangered Grevy's zebra (*E. grevyi*). Since global numbers of Grevy's zebra have declined dramatically in recent decades due to human activity, hybridization could represent a significant further risk to the conservation of the species. Fortunately, as Cordingley *et al.* (2009) outline, hybridization does not appear to constitute a serious threat to Grevy's zebra since hybrids seemingly integrate into plains zebra society. Thus while the hybrids are reproductive, there appears to be little possibility of backcrossing due to behavioural isolation and gene flow is essentially unidirectional from the Grevy's zebra to the plains zebra population. As long as these conditions persist there is little immediate threat to the Grevy's zebra population from hybridization with plain zebra.

These results are important since they suggest that conservation resources would be wasted on trying to control the hybridisation and management efforts would be better directed at other, more immediate threats to Grevy's zebra populations. The one caveat to this, however, relates to the anomalous result of two Grevy's zebra females having plains zebra mtDNA haplotypes. While Cordingley *et al*. (2009) attribute this to an error in sample collection, there is an urgent need for further genetic sampling to ensure that the current findings are robust and substantiated in a broader sample. Without such confirmation it may be premature to conclude that hybridization is of little risk to the Grevy's zebra gene pool. In essence, it would be difficult to categorically direct management efforts away from the issue of hybridization when there is any uncertainty over the scientific basis of this decision. Errors made now may not easily be undone in future years.

Nevertheless if, as seems likely, the conclusions of Cordingley *et al*. (2009) are confirmed with further sampling, the current study does suggest that Grevy's zebra gene pool may still be at risk even if hybridization is not the major threat. The Grevy's zebra within the Ol Pejeta population appear isolated from other neighbouring populations, and the main anthropogenic threats the species suggest that the meta-population could become increasingly fragmented in isolated populations. Lessons from another endangered African equid, the Cape mountain zebra (*E. zebra zebra*) indicate that this can have disastrous genetic consequences. Hunting and habitat destruction over the past three centuries decimated the world population of Cape mountain zebra to fewer than 100 individuals in five relict populations, and while sustained conservation efforts have elevated this number to more than 1600 animals, over 90% of the stock has derived from a single source population (Moodley & Harley, 2005). The result is low genetic variation within individual Cape mountain zebra populations, the characteristic signature of population fragmentation and drift. Moderate variation does still exist across the entire Cape mountain zebra meta-population suggesting that a management strategy focussed on the mixing of the original relict populations could halt further loss of genetic diversity (Moodley & Harley, 2005). Such a strategy is far from straightforward, however, and active management is required to sustain population growth in critical populations (Watson *et al*., 2005; Smith *et al*., 2008).

While the situation is far from this serious in Grevy's zebra, evidence from the other mountain zebra subspecies, Hartmann's mountain zebra (*E. z. hartmannae*), suggests that genetic variation may be lost even in larger, more contiguous populations. Genetic variation in free-ranging Hartmann's mountain zebra populations is lower than expected for an outbred African mammal (Moodley & Harley, 2005), an observation explained by a recent ephemeral population bottleneck coupled with increasing fragmentation through human population expansion and the construction of game farms and their associated game fences. Such conditions may more closely mirror the current situation with Grevy's zebra. If so then it is likely that anthropogenic activity leading to increased isolation and fragmentation of the remaining Grevy's zebra populations could already be having discernable effects on levels of genetic variation. As a consequence it seems critical that conservation efforts are directed at ensuring small populations do not become isolated and that gene flow between populations remain. Not only will isolation provide potential conditions for hybridization, but it will also increase the chances of genetic drift eroding genetic diversity from within the population. Thus while the news on hybridization reported here may be positive for Grevy's zebra, the complete genetic picture may not be so rosy.

Cordingley *et al*. (2009) have clearly demonstrated the potential value of genetic studies in directing conservation and management efforts for endangered species. While hybridization does not appear to represent an immediate threat to the Grevy's zebra gene pool, the anthropogenic factors promoting hybridization may be indicative of more pressing threats to genetic variation in this endangered equid.

References

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